

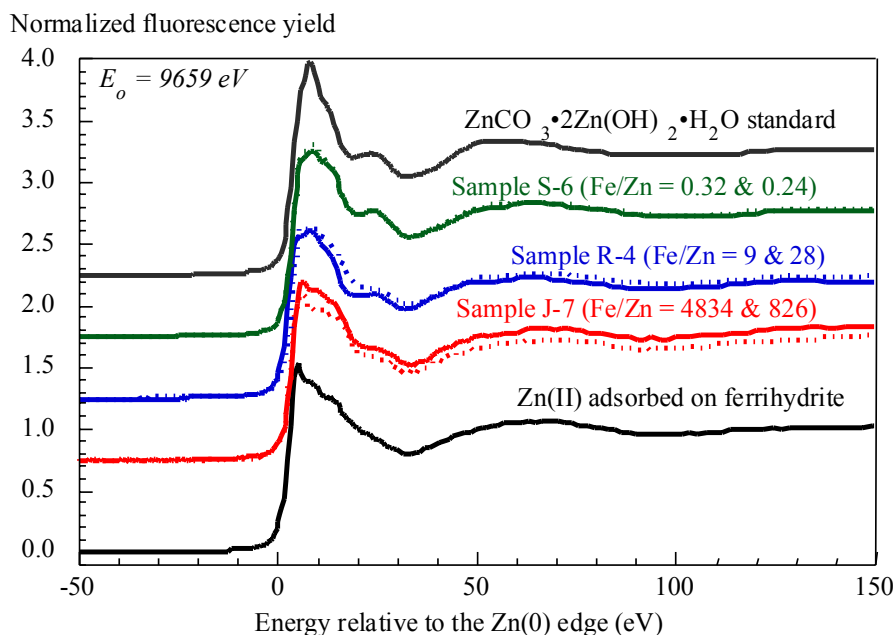
## Zn Speciation of Neutralization Sludges from Mining Industries in Canada

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The Canadian mine industry produces annually large volume of neutralization sludges that are disposed in ponds or co-deposited with tailings. Chemical and mineralogical characterization of the sludges showed the presence of a major hydrated amorphous phase in which several metal species were associated. The fate of those trace metals is yet unknown. Among the different trace metals present, Zn is often of concerned because of its relatively high concentration in many sludges. Knowledge of detailed Zn speciation would help assess the long-term stability of Zn in the aged sludges. The objective of this research was to characterize the Zn species in different sludges and assess the impact of aging on Zn speciation for each type of sludge. XANES and EXAFS analyses of Zn speciation in three types of limed sludges varying in Zn concentration ( $0.5$  to  $2200 \text{ mmol kg}^{-1}$ ) and time of aging, suggested that a mixed, poorly-crystalline Zn-carbonate/Zn-hydroxide mineral was dominant in two sludges with relatively low Fe/Zn molar ratios. In the sludge with the greatest Fe/Zn molar ratio, Zn adsorbed on non-crystalline iron oxide minerals was also significant. No major differences in Zn speciation were observed between fresh and aged sludges. The Zn speciation data provide insight that help project how changes in chemical conditions may affect changes in sludge chemistry, thereby influencing Zn mobility. For example, if Zn mainly occurs as carbonate or hydroxide species, then moderate acidification of the sludge would release Zn. On the contrary, if Zn is bound within the structure of Fe-oxide minerals that precipitate during the liming process, then a more drastic chemical change such as reduction or extreme acidification would be needed to release the Zn.



**Figure 1.** Stacked zinc K-XANES spectra for neutralization sludge samples and representative standard species. Solid lines are the fresh samples and dotted lines are aged limed sludges. Molar Fe/Zn ratios are for fresh and aged samples, respectively.